

Height of a Leonid Fireball. By W. F. Denning.

A large meteor observed under nearly similar circumstances to those attending the Perseid fireball of August 13 last (*Monthly Notices*, 1888, November, p. 19) was recorded at Bristol and Sunderland on the night of November 13, at 17^h 19^m.

The observations were as under :—

Bristol.—The writer recorded twenty-nine meteors between the hours of 15^h 30^m and 18^h (1888, November 13), and amongst this number there were seventeen which, by their directions and other features of appearance, conformed with the well-known stream of Leonids. The radiant point was in the usual position at 149° + 22°, and three of the meteors were unusually large with apparent paths as follows :

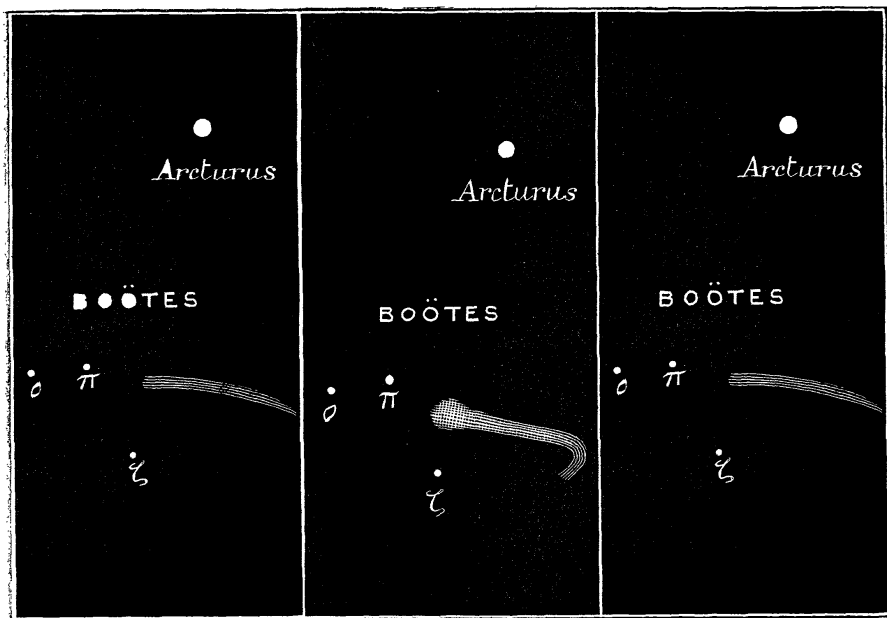
		Mag.	From	To	Appearance.
1888.	h m				
Nov. 13	16 41	4	166° + 34°	172° + 37½°	V. swift, b. streak 5 ^s
	16 55	Fireball	125½° - 22°	121° - 30½°	V. b. flash, swift, stk. 10 ^s
	17 19	4	252° + 33½°	257½° + 31°	Swift, streak 5 ^s

The fireball at 16^h 55^m was a splendid object, though it appeared very low in the southern sky. The meteor at 17^h 19^m was also of considerable size, but its apparent brilliancy must have been greatly subdued by its situation in the mist immediately contiguous to the N.E. horizon. It appeared slightly N. of ϵ *Herculis* and its line of flight was sensibly parallel with ϵ and ζ *Herculis*.

Sunderland—Mr. T. W. Backhouse was watching the progress of the Leonid shower on the same night. At 17^h 19^m he became suddenly aware of a bright flash and, a few seconds later, discovered an unusually intense meteor-streak lying amongst the stars of *Boötes* and about 5° below *Arcturus*. It was estimated as 4° long at first, and proved very durable, for it remained in sight during a period of nine minutes, during which it exhibited some alterations both in its shape and position. Mr. Backhouse was careful to notice the place of the streak directly after its first detection, when it extended from 213½° + 16½° to 217¼° + 15°, and he justly surmised it had been left by a Leonid fireball.

On comparing the pair of observations at 17^h 19^m it becomes obvious they relate to the same body, and that a satisfactory path can be derived from them. The radiant point is shown at 149° + 25° in the northern part of the sickle of *Leo*, which was in azimuth E. 50½° S. at the moment of the meteor's apparition. The heights of the beginning and end points of its path, observed at Bristol, were 65 and 37 miles respectively, and its central position was above a place in the North Sea, in about lat. 55¼° N., long. 3¾° E. The long enduring light streak visible

at Sunderland was nearly 15 miles in length, and the heights of its extremities were 57 and 45 miles. Its mean elevation was



Streak of fireball, 1888, November 13, observed at Sunderland.

therefore 51 miles, which is but slightly less than that of the streak of the Perseid fireball before adverted to, and which indicated an average height of 53 miles. The length of the meteor's visible course was 34 miles, and its Earth-point was near lat. $55^{\circ}6$ N., long. $3^{\circ}3$ E. The duration of its flight was not estimated, so that its velocity cannot be determined. At Bristol, however, it was described as "swift," and the direct inference is that its motion probably accorded with the usual high rate of speed attributed to the Leonids.

Summarising the results we have:

Beginning of meteor (Bristol)	...	...	...	65 miles high
" " light streak (Sunderland)	...	...	...	57 "
End of light streak (Sunderland)	...	...	...	45 "
End of meteor (Bristol)	...	...	...	37 "
Inclination to mean horizon	...	...	...	57°
Entire length of observed real path (Bristol)	...	...	...	34 miles.

The heights do not differ materially from the average of fireballs (*Monthly Notices*, 1888, January, p. 113), though the length of path is decidedly shorter than usual. But the meteor was at a great distance (more than 360 miles) from Bristol, and being

so close upon the horizon the conditions for glimpsing the fainter sections of its track were extremely unfavourable. It is certain that the low-lying vapours combined with the excessive distance in obliterating the streak which remained so persistent at Sunderland. The same effects were produced by similar causes in the case of the Perseid fireball, the streak of which endured at Leeds for three minutes, whereas at Bristol, the distance being greater and altitude of the object much less, it continued to be seen no longer than 40 secs. It will be interesting during future observations to compare the heights of the durable streaks which are so often generated by fireballs, and to further trace the effects of distance and altitude upon their visibility at different stations.

The diagram represents successive views of the streak left by the recent Leonid fireball. This feature had become very faint at 17^h 28^m (9 min. after first appearance), when it was just observable with an opera-glass, power 4.

Bristol: 1888, December 12.

The Great Southern Comet (1887 I). By Dr. H. Oppenheim.

(Extract from a letter to Mr. Knobel.)

Being at present occupied with a determination of the orbit of the great Southern Comet (1887 I), I have examined some observations made at sea by Captain Molony, which appeared in the *Monthly Notices*, vol. xlvii. p. 432.

As altogether only 19 observations of this Comet are known, earlier observations have great importance, as sextant observations have equal value with those of fixed instruments, which give distances to half a degree (*Astronomische Nachrichten*, Band 117, p. 13).

Captain Molony's observations as printed in the *Monthly Notices* appear, however, to be incorrect, as will be seen from the accompanying comparison. Would it be possible for you to make the observer acquainted with this, and inform me as to his reply? *

The following results are obtained from a comparison of the observations of Comet 1887 in the *Monthly Notices*, vol. xlvii. p. 432 (taking refraction into account) with the elements given in the *Astronomische Nachrichten*, 117, p. 13.

* Lieut. Baillie, of the Meteorological Office, has kindly compared the observations as printed in the *Monthly Notices* with Capt. Molony's meteorological log, and finds they have been correctly copied, so that the errors must rest with the observer.